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Corporate Financial Policy and the Value of Cash

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ABSTRACT

We examine the cross-sectional variation in the marginal value of corporate cash holdings that arises from differences in corporate financial policy. We begin by providing semi-quantitative predictions for the value of an extra dollar of cash depending upon the likely use of that dollar, and derive a set of intuitive hypotheses to test empirically. By examining the variation in excess stock returns over the fiscal year, we find that the marginal value of cash declines with larger cash holdings, higher leverage, better access to capital markets, and greater as firms choose cash distribution via dividends rather than repurchases.

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What value do shareholders place on the cash that firms hold, and how does that value differ across firms? While an extensive literature attempts to estimate the value of adding debt to a firm's capital structure, the search for estimates of the value of additional cash has not received nearly as much attention. This is a non trivial oversight considering corporate liquidity enables firms to make investments without having to access external capital markets, and to thereby avoid both transaction costs on either debt or equity issuance and information asymmetry costs that are often associated with equity issuances. Moreover, corporate liquidity reduces the likelihood of incurring financial distress costs if the firm's operations do not generate sufficient cash flow to service obligatory debt payments. Corporate liquidity comes at a cost,however, since interest earned on corporate cash reserves is often taxed at a higher rate than interest earned by individuals. Further, cash may provide funds for managers to invest in projects that offer non pecuniary benefits but destroy shareholder value (Jensen and Meckling (1976)). Given the extent to which the literature examines the effect of these same frictions on capital structure, it is surprising that the value implications of holding cash in the presence of these frictions have not been similarly explored.[1]

Recent empirical studies of corporate cash holdings (e.g., Opler, Pinkowitz, Stulz, and Williamson (1999) and Harford (1999)) examine the cross-sectional variation in the level of cash holdings related to the above theoretical benefits and costs.[2] Consistent with the hypothesized effects, they find that firms with stronger growth opportunities, riskier cash flows, and more limited access to capital markets hold higher cash balances. Now that we understand the characteristics that determine how much cash firms hold, we move to the question of what value the market places on the cash holdings of firms and how that value varies cross-sectionally.

In generating empirical predictions, we argue that the value (to the equity holder) of one additional dollar of cash reserves should vary considerably depending upon whether that dollar is more likely to go to: 1) Increasing distributions to equity via dividend payments or share repurchases, 2) decreasing the amount of cash that needs to be raised in the capital markets, depending upon the firm's capital market accessibility, or 3) servicing debt or other liabilities of the firm.

For firms whose cash reserves appear to greatly exceed their needs in the foreseeable future, an additional dollar of cash reserves is more likely to be distributed to equity holders through dividends and/or stock repurchases. However, because of the "dividend tax", only the fraction $(1-\tau_d)$ ends up in the hands of shareholders.[3] As such, the marginal value of cash is reduced to $(1-\tau_d)$, which can be significantly below \$1. Additionally, if firms use their cash to pay down debt or other liabilities, a small increase in cash reserves partially goes to increasing debt value, not solely to increasing equity value. Thus, the equity market will place a lower value on an additional dollar of cash for high leverage firms relative to the marginal value of cash for a firm with little debt. In contrast, for those firms that need to raise cash from external markets because they have value-enhancing investment opportunities but their internal funds are low, the marginal value of cash should be higher than \$1, with the exact amount depending upon the transactions costs (direct or otherwise) that are incurred by accessing the capital markets. Therefore, the marginal value of cash should decline as cash holdings increase because as the cash position of the firm improves, firms become more likely to distribute funds and less likely to raise cash.

We also argue that for firms that face greater financing constraints, especially those with valuable investment opportunities, the marginal value of cash should be higher than for firms that can easily raise additional capital. While financial constraints are often associated with information asymmetries between firms and capital providers, they can be thought of as tantamount to higher transactions costs in accessing external capital. In such a context, an additional dollar of internal funds enables a constrained firm to avoid these higher costs of raising funds,thereby, rendering additional internal funds relatively more valuable.

Below, we use these arguments to formalize hypotheses about how the marginal value of cash should vary across firm characteristics. We then test these hypotheses empirically and find broad support for them. Indeed, our main empirical results include:

- The average marginal value of cash across all firms is \$0.94.
- As firms' cash levels and leverage increase, their marginal value of cash decreases signif-

icantly.

- For those firms that distribute cash, the marginal value of cash is \$0.13 higher if they do so by stock repurchase rather than by dividend payments. This number is consistent with a dividend tax rate that is 13% higher than the capital gains tax rate on repurchases for the marginal shareholder.[4]

- The average marginal value of cash for those firms that are likely to have more difficulty accessing capital is significantly higher than for those firms that are less likely to be constrained.

- The difference in the marginal value of cash between constrained firms and unconstrained firms is especially large among those firms that appear to have valuable investment opportunities but low levels of internal funds.

In a similar paper, Pinkowitz and Williamson (2004) also examine the marginal value of cash, focusing largely on the cross-sectional variation related to the firm's investment opportunity set.[5] Using the methodology of Fama and French (1998), they find that shareholders of a firm with better growth options and more volatile investment opportunities place higher values on the firm's cash than a firm with fewer, more stable growth opportunities. In contrast, we focus on how the value of cash varies with firm financial characteristics and we use a methodology that examines the variation in excess equity returns rather than in the level of the market-to-book ratio. Because we normalize all independent variables by the firm's equity value at the end of the previous fiscal year, we can interpret our estimated coefficients as the change in equity value associated with a \$1 change in the corresponding independent variable. Using this methodological approach, we report estimated coefficients that appear to be both quantitatively and qualitatively consistent with all of our hypotheses.

In Section I, we argue that there are essentially three different cash regimes and that the marginal value of cash depends upon the likelihood with which a firm will find itself in each of these different regimes. We then generate a set of hypotheses for how the marginal value of cash should be affected by changes in the level of corporate liquidity, the amount of

debt in the firm's capital structure, and the accessibility of external capital. In Section II, we discuss the empirical methodology that we utilize to test these hypotheses and provide further explanations for why we prefer this approach in estimating the value associated with a particular firm characteristic. The data sources and summary statistics are provided in Section III.

Section IV contains the results of testing our empirical hypotheses. We begin with our baseline specification, which estimates the effects of leverage and the level of cash on the marginal value of cash for the firms in our sample. Because our approach uses excess returns, estimating the marginal value of cash requires estimating the *unexpected* change in the firm's cash position over the corresponding return period. We therefore conduct numerous robustness tests in which we estimate the expected change in cash and then use the difference between the realized change and the expected change in our analysis. As the results demonstrate, our findings are quite stable, both statistically and economically, across these different measures. We then move on to utilize multiple definitions of being financially constrained to examine how capital market accessibility impacts the value that the market places on additional corporate cash. Finally, we examine subsamples of firm-years that are most likely to fall into our three cash regimes and further demonstrate that the estimated marginal values of cash have differences that are consistent with our hypotheses. Section V concludes.

I. Three Cash Regimes

As mentioned in the Introduction, the value (to the equity holder) of one additional dollar of cash reserves should vary considerably depending upon the cash regime to which a firm is likely to belong. The identification of the three different regimes here is similar to that of Hennessy and Whited (2005), who investigate optimal dynamic capital structure.[6] This identification is important because it not only allows us to make qualitative predictions for how the marginal value of cash should vary cross-sectionally, but it also allows us to provide

semi-quantitative estimates for the marginal value of cash cross-sectionally.

A. Regime I: Distributing Cash

Consider a firm that is currently carrying excess cash in that the sum of current cash on hand and expected short-term earnings is more than sufficient to fund both the short term liabilities of the firm and any possible investments in new value-enhancing projects that may arise. If there were no costs to holding cash, then it would be optimal for the firm to retain large cash reserves rather than distribute the excess cash in order to guarantee that the firm will not need to incur the transaction costs associated with raising cash. However, taxes and agency costs generate costs to holding excess cash. First, because the corporate tax rate is generally higher than the personal tax rate paid on interest income, investors are better off if they hold excess cash themselves rather than the firm. Second, agency costs due to the "free cash flow" problem (Jensen (1986)) are more likely for firms with excess cash reserves. Hence, it will be optimal for firms with excess cash to distribute funds to shareholders via dividends or share repurchases, and shareholders will not place a high value on a marginal dollar of cash for these firms.

Specifically, we argue that the marginal value of cash for firms that are likely to distribute large sums of cash is less than \$1. Defining τ_d as the tax rate on dividends, only $(1-\tau_d)$ of every dollar distributed by the firm in the form of dividends finds its way into the hands of shareholders. Moreover, the fact that the corporate tax rate τ_c on earned interest is typically greater than the tax rate τ_i on earned interest for individuals implies that the marginal value of any excess cash that is not immediately distributed is significantly lower than $(1-\tau_d)$. Indeed, consider the extreme example of a firm with no debt whose only asset is cash placed into a risk-free security. Without taxes and payouts, the cash holdings grow according to

$$dC_t = r\,C_t\,dt. \tag{1}$$

However, if we assume that earnings are taxed at τ_c and that the cash payout is a fraction β

of the after-tax earnings, then the cash holdings grow according to

$$dC_t = r\,C_t\;(1-\tau_c)\,(1-\beta)\;dt, \tag{2}$$

implying that

$$C_t = C_0 e^{r\,t\,(1-\tau_c)(1-\beta)}. \tag{3}$$

Moreover, the distribution to shareholders over the interval dt would be

$$dX = r\,C_t\;(1-\tau_c)\;\beta\,dt, \tag{4}$$

which would be taxed at the dividend rate τ_d. Note that this after-tax cash flow is risk free so the appropriate discount rate for this stream of cash flows is the personal after-tax risk-free rate $r\,(1-\tau_i)$. Hence, the value of this equity claim is

$$\begin{aligned} E(C_0) &= \int_0^\infty dX\,(1-\tau_d)\;e^{-rt\left(1-\tau_i\right)} \\ &= C_0\,(1-\tau_d)\;(1-\tau_c)\;r\,\beta\int_0^\infty e^{r\,t\,(1-\tau_c)(1-\beta)}e^{-rt\left(1-\tau_i\right)}\;dt \\ &= C_0\,(1-\tau_d)\;\frac{(1-\tau_c)\;\beta}{(1-\tau_i)-(1-\tau_c)\,(1-\beta)} \end{aligned} \tag{5}$$

and the marginal value of cash for this firm is

$$\frac{\partial E}{\partial C} = (1-\tau_d)\;\frac{(1-\tau_c)\;\beta}{(1-\tau_i)-(1-\tau_c)\,(1-\beta)}. \tag{6}$$

Note that in the special case in which $\tau_c = \tau_i$, that is, interest earned by the corporation is not taxed more heavily than interest earned by individuals, then equation (6) reduces to

$$\frac{\partial E}{\partial C} = (1-\tau_d)\,. \tag{7}$$

However, even small differences between τ_c and τ_i can have large effects on the marginal value of cash for levels of β that are observed in the data. For example, if we consider the base case

$\tau_d = 0.25$, $\tau_c = 0.35$, $\tau_i = 0.30$, and $\beta = 0.25$, we find that the marginal value of cash for this "cash cow" is

$$\frac{\partial E}{\partial C} = 0.57, \tag{8}$$

which is significantly lower than $(1 - \tau_d) = 0.75$ due to the dividend tax alone. This result is reminiscent of the insights of Berk and Stanton (2004) who demonstrate that the closed-end fund discount can be explained by a small cost given that the payout ratio is small. This result suggests that the marginal value of cash for firms with excess cash (i.e., bad investment opportunities and high cash levels) are predicted to be well below \$1. The presence of agency costs due to free cash flow problems would only reduce this estimate further.

B. Regime II: Servicing Debt or Other Liabilities

For highly leveraged firms, contingent claims analysis (e.g., Black and Scholes (1973), Merton (1973)) predicts that almost all firm value is in the hands of the debt holders. As such, a small increase in cash reserves goes largely to increasing debt value, not equity value, implying in turn that the equity market will place a low value on an additional dollar of cash for these firms. Furthermore, this "option theory" predicts that the marginal value of cash to equity holders should increase as leverage declines, since the probability of avoiding bankruptcy, and therefore the probability of the extra dollar finding its way into the pocket of equity holders, increases.

C. Regime III: Raising Cash

We argue that the marginal value of cash for firms that are likely to raise cash in the near future should be higher than \$1, and that the amount varies depending upon the ease with which the firm can access the capital markets.

Consider two firms that need to raise capital immediately because they have a value-enhancing project and their current cash holdings are low. Assume that these firms are identical except that Firm A has one additional dollar of cash reserves. Hence, Firm B needs to raise

one more dollar of cash than Firm A to fund the investment. In the presence of a proportional transactions cost (direct or otherwise) f that is incurred by accessing the capital markets, raising this additional dollar will cost Firm B an additional $\left(\frac{1}{1-f}\right)$.

For firms that raise cash optimally, the marginal value of cash should reach an upper bound of $\frac{1}{1-f}$. The argument is straightforward: If the market currently values an additional dollar of cash at higher than $\frac{1}{1-f}$, then the firm can increase its equity value by raising additional cash now. Hence, under the objective of shareholder-maximizing behavior, firms should raise their cash levels so that the marginal value of cash never exceeds $\frac{1}{1-f}$. Assuming transactions costs are not too high, this argument suggests that the marginal value of cash will be slightly greater than \$1 for "*unconstrained*" firms that are at the margin of raising cash. As firms face financing constraints, which can be thought of as larger transactions costs f (whether direct or indirect), they are expected to have even higher marginal values of cash, all else equal.

D. Empirical Predictions

Now that we have explained why the marginal value of cash should vary considerably depending upon which regime the firm is likely to face, we seek to link firm financial characteristics to these regimes, by specifying a set of hypotheses that we empirically test below.

HYPOTHESIS 1: *The marginal value of cash is decreasing in the level of the firm's cash position.*

A firm with a low level of cash reserves is more likely than firms with high cash balances to be in the third cash regime, that is, needing to access the external capital markets to fund its short-term liabilities and investments. Due to the transactions costs (direct and indirect) incurred by accessing the capital markets, the value of an additional dollar of cash for such a firm is greater than one. Holding profitability constant, as cash holdings increase, the firm is less likely to access capital markets in the near future and is instead more likely to return cash to shareholders. Thus, greater cash levels reduce the probability of the firm being in regime three and instead, the first cash regime becomes more likely, in which case the value of an

additional dollar of cash could be significantly lower than one, due to higher corporate tax rates relative to investor tax rates and the free cash flow problem. Therefore, for firms that are not near bankruptcy, the marginal value of cash should be a decreasing function of the cash level, as the likelihood of being in the high marginal cash value regime diminishes and the likelihood of being in the lower marginal value of cash regime increases.

HYPOTHESIS 2: *An extra dollar of cash holdings is less valuable for shareholders in highly levered firms than in firms with low leverage.*

This hypothesis is common in most capital structure models. As firms generate more cash flow or accumulate higher cash balances, if the debt is risky, the increase in firm value is shared by the debt and equity holders. For firms with low leverage, and therefore less risky debt, an increase in the firm's cash position has very little impact on the probability of the debt holders being paid in full. As leverage increases, all else equal, more of the firm value generated by additional cash benefits the debt holders. This effect can be motivated by interpreting an equity security as a call option on the firm's value and thinking of the debt holders as being short a put option on the value of the firm. As the strike price increases, that is, as the firm takes on more debt, holding constant the value of the firm, the delta of the option decreases. So, while an increase in cash increases the value of the underlying firm, thereby increasing the value of both the debt and the equity, more of the value associated with the increase in cash will accrue to the equity holders as the firm has less leverage.[7]

HYPOTHESIS 3: *An extra dollar of cash holdings is more valuable for shareholders in financially constrained firms.*

Returning to our discussion of firms that access capital markets, a firm that faces financial constraints can be thought of as facing a higher cost f when raising external funds. As a result, the marginal value of cash may be higher for these firms since internal funds enable the firm to avoid incurring this higher cost. Additionally, if the firm has investment opportunities,

the higher the cost of raising external funds, the more likely it is that these value-enhancing projects will be forgone if internal funds are insufficient. Fazarri, Hubbard, and Petersen (1988) document the presence of an investment cash flow sensitivity that is consistent with financial constraints deterring firms from being able to make investments when internal funds are insufficient to fund them. If capital market access were perfect, then regardless of the firm's liquidity, it would always be able to fund positive net present value (NPV) projects. As access to capital becomes more difficult, forgoing positive NPV projects is more likely, absent internal funds. Therefore, for constrained firms, higher cash holdings increase the likelihood of taking positive NPV projects that would otherwise be forgone, whereas liquidity provides no such benefit for unconstrained firms. This effect should be most prevalent for firms that are more likely to have investment opportunities but little internal cash with which to fund those investments.

There are numerous other studies that present evidence consistent with our third hypothesis. Korajczyk and Levy (2003) find that target leverage is counter cyclical for relatively unconstrained firms, but pro cyclical for relatively constrained firms; unconstrained firms time their security issuance to coincide with periods of favorable macroeconomic conditions, while constrained firms do not. Almeida, Campello, and Weisbach (2004) find that financially constrained firms systematically save cash out of cash flow while unconstrained firms do not. Acharya, Almeida, and Campello (2004) build upon those results by separating out constrained firms based upon the correlation between cash flow and investment opportunities. They show that financially constrained firms whose investment opportunities arise when operating cash flows are relatively low save cash rather than pay down debt. On the other hand, unconstrained firms and constrained firms with a high correlation between the presence of investment opportunities and high cash flows pay down debt rather than save cash. These previous empirical results support the hypothesis that the accessibility of capital affects the capital structure and liquidity choices of firms, which should be accompanied by differences in the value of cash across firms with differential access.[8]

II. Empirical Methodology

In this paper, the basic questions we investigate are what value do shareholders place on an extra dollar of cash held by firms, and what financial characteristics affect that value? If shareholders believe that difficulty in accessing capital markets may sometimes lead firms to forgo value-creating investments, then a dollar of cash may be worth more than a dollar. Alternatively, if shareholders believe that extra cash only serves to increase (taxable) distributions, or only generates free cash flow problems, then the marginal value of cash may be significantly less than $1.

To test these hypotheses, we develop a methodology that generates estimates of the additional value the market incorporates into equity values that result from changes in the cash position of firms over the fiscal year. Following Grinblatt and Moskowitz (2004) and Daniel and Titman (1997), our dependent variable is a stock's excess return over the fiscal year, which is defined to be stock i's return during fiscal year t less the return of stock i's benchmark portfolio during fiscal year t. The benchmark portfolios, defined below, are designed to offset the expected return component of stock i due to its size and market-to-book ratio at the beginning of the fiscal year. We regress that excess return on changes in firm characteristics, focusing on the estimated coefficient that corresponds to the variable measuring the ratio of the unexpected change in cash to the firm's lagged equity value.[9] Since both the dependent and independent variables are standardized by the lagged market value of equity, the coefficient measures the dollar change in shareholder value resulting from a one dollar change in the amount of cash held by the firm.

We argue that our methodology for estimating the value associated with a firm characteristic is an improvement over the Fama and French (1998) methodology, which focuses on the cross-sectional variation in the market-to-book ratio, for two important reasons. First, we incorporate time-varying risk factors into our estimation. Part of the time-series variability in the market-to-book ratio used in Fama and French (1998) should come from differences over time in the compensation for risk, and therefore the market value of the firm. Their methodology controls for firm-specific characteristics that affect expected cash flows, but does

not include measures that capture differences in sensitivities to risk factors, and therefore differences in discount rates. We address this by using a stock's benchmark return to control for the time-series variation in risk factors and the cross-sectional variation in exposures to those factors.[10] Second, with regard to the dependent variable, unlike the ratio of market-to-book, equity returns are easy to measure and interpret. Fama and French (1998) note that they would "prefer to measure assets at replacement cost, but we do not have the necessary data." As a result, part of the variability in market-to-book may result from the cross-sectional differences in accounting for the book value of assets relative to their true replacement cost. If accounting methods across firms are correlated with liquidity, this correlation might bias the estimates of the marginal value of cash.[11]

We recognize that stock returns should be affected both by common risk factors and by changes in firm-specific characteristics. Since firm-specific risk factors are very noisy and can be diversified away, most papers in the asset pricing literature only look at portfolio returns. However, since the emphasis of this paper is how changes in cash holdings affect shareholder wealth, we need to examine individual stocks instead of portfolios. While we are interested in the change in equity value associated with changes in the cash holdings of firms, it is important to control for other factors that may be correlated with changes in cash that may also affect firm value. Therefore, we regress the excess equity return over the fiscal year on not only the change in cash holdings, but also on changes in a firm's profitability, financing policy, and investment policy. We initially assume that firms have the same sensitivity to these firm-specific factors. We then test our hypotheses by including interaction terms and by examining differences in coefficients across subsamples. Throughout the analysis, our focus is on the value of the unexpected change in cash, captured by its coefficient and the coefficients corresponding to interactions with other financial variables.

To arrive at our estimate of the excess return, we use the 25 Fama and French portfolios formed on size and book-to-market as our benchmark portfolios. A portfolio return is a value-weighted return based on market capitalization within each of the 25 portfolios. For each year, we group every firm into one of 25 size and BE/ME portfolios based on the intersection between

the size and book-to-market independent sorts. Fama and French (1993) conclude that size and the book-to-market of equity proxy for sensitivity to common risk factors in stock returns, which implies that stocks in different size and book-to-market portfolios may have different expected returns. Therefore, stock i's benchmark return at year t is the return of the portfolio to which stock i belongs at the beginning of fiscal year t. To form a size- and BE/ME-excess return for any stock, we simply subtract the return of the portfolio to which it belongs from the realized return of the stock.[12]

Our baseline regression model is:

$$\begin{aligned} r_{i,t} - R^B_{i,t} &= \gamma_0 + \gamma_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_2 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \gamma_3 \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \gamma_4 \frac{\Delta RD_{i,t}}{M_{i,t-1}} \\ &+ \gamma_5 \frac{\Delta I_{i,t}}{M_{i,t-1}} + \gamma_6 \frac{\Delta D_{i,t}}{M_{i,t-1}} + \gamma_7 \frac{C_{i,t-1}}{M_{i,t-1}} + \gamma_8 L_{i,t} + \gamma_9 \frac{NF_{i,t}}{M_{i,t-1}} \\ &+ \gamma_{10} \frac{C_{i,t-1}}{M_{i,t-1}} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_{11} L_{i,t} * \frac{\Delta C_{i,t}}{M_{i,t-1}} + \epsilon_{i,t}, \end{aligned} \tag{9}$$

where the term ΔX indicates *unexpected* changes in the variable X. As previously stated, we initially use the realized change, assuming that the expected change is zero, and then conduct a number of robustness tests with varying estimates of the unexpected change in cash.

The dependent variable in our regression is the excess stock return, $r_{i,t} - R^B_{i,t}$, where $r_{i,t}$ is the stock return for firm i during fiscal year t and $R^B_{i,t}$ is stock i's benchmark return at year t. The independent variables are firm-specific factors that control for sources of value other than cash that may be correlated with cash holdings. The financing variables that we are interested in include the cash holdings of firm i at time t ($C_{i,t}$), interest expense ($I_{i,t}$), total dividends ($D_{i,t}$), market leverage at the end of fiscal year t ($L_{i,t}$), and the firm's net financing during the fiscal year t ($NF_{i,t}$). We also control for changes in the firm's profitability using earnings before interest and extraordinary items ($E_{i,t}$) and changes in the firm's investment policy by controlling for total assets net of cash ($NA_{i,t}$) and R&D expenditures ($RD_{i,t}$). To avoid having the largest firms dominate the results, we deflate the firm-specific factors (except leverage) by the one-year lagged market value of equity ($M_{i,t-1}$). Since the stock return is the spread of ($M_{i,t} - M_{i,t_1}$) divided by $M_{i,t-1}$, this standardization enables us to interpret the

estimated coefficients as the dollar change in value for a one-dollar change in the corresponding independent variable.

Additionally, we add interaction terms to test the hypotheses stated in the previous section. We use $\frac{C_{i,t-1}}{M_{i,t-1}} * \frac{\Delta C_{i,t}}{M_{i,t-1}}$ in order to estimate the effect of changes in the value of cash for different levels of cash holdings. Following the first hypothesis, we expect the coefficient γ_7 to be negative, indicating that the marginal value of cash is decreasing in the amount of cash the firm has. We also include $L_{i,t} * \frac{\Delta C_{i,t}}{M_{i,t-1}}$ in the regression to capture the effect of leverage on the marginal value of cash holdings. Based upon our second hypothesis, we expect γ_8 to be negative, indicating that as firms have more leverage, less of the value created by the presence of extra cash accrues to shareholders. In these regressions, we also include the lagged cash position and the level of leverage to ensure that our estimated coefficients on the interaction terms are due to the interaction, and not due to the cash position or leverage individually.

The methodology we use is essentially a long-term event study. Generally, the focus of event studies is to estimate the effect of a firm event on the return of its common stock. In standard event study methodology, the net present value of the event is estimated by looking at the abnormal return experienced around the time of the event. The expected return is estimated using a performance model whose parameters are estimated outside the event window. In this paper, we focus on how the change of cash holdings affects stock returns, controlling for other relevant changes in the firm's financial status. The event in which we are interested is the unexpected change of cash holdings, and the event window is defined to be the fiscal year. Since there is not an estimation window, we instead estimate the expected return by using the benchmark returns of the 25 size and book-to market portfolios. By subtracting the benchmark return from the stock return, we control for the expected return of the stock. The unexpected changes in the firm-specific factors should therefore explain the abnormal returns, similar to an event study.

III. Data and Summary Statistics

The data for this paper come from the 2001 COMPUSTAT tapes (numbers in parentheses

are COMPUSTAT data item numbers) and 2001 CRSP tapes over the 1971 to 2001 period. We exclude all financial firms and utility firms (SIC codes between 6000 and 6999, and between 4900 and 4999, respectively). Our measure of stock returns includes distributions during the fiscal year. The breakpoints for the 25 portfolios formed on size and BE/ME and the portfolio monthly returns are from Kenneth R. French's webpage.[13] All returns correspond to the 12-month period representing the fiscal year of the firm.

All data are converted to real values in 2001 dollars using the consumer price index (CPI). The market value of equity is defined as the number of shares (54) multiplied by the stock's closing price at the fiscal year-end (199). Cash holdings equals cash plus marketable securities (1). Net assets is total assets (6) minus cash holdings. Following Fama and French (1998) and Pinkowitz and Williamson (2004), earnings are calculated as earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits (18+15+50+51). Total dividends are measured as common dividends paid (21). Leverage is defined as the market debt ratio, calculated as total debt (9+34) over the sum of total debt and the market value of equity. Net financing is total equity issuance (108) minus repurchases (115) plus debt issuance (111) minus debt redemption (114). We also use R&D expenditures (46), which equals zero if missing, and interest expense (15).

We trim our firm-specific factors and dependent variable at the 1% tails measured using the full sample, to reduce the impact of outliers. Since we require one year of changes for some variables, our usable sample starts in 1972. We eliminate firm-years for which net assets is negative, the market value of equity is negative, or dividends are negative. Our final sample consists of 82,187 firm-years. Summary statistics for the sample can be found in Table I.

Insert Table I - Summary Statistics here

Recall that all independent variables, excluding leverage (L_t), are deflated by the lagged market value of equity, thereby allowing us to interpret our results as the dollar increase in value associated with a one-dollar change in the explanatory variable. We see that the median

firm has a -8.45% one-year excess (abnormal) stock return while the mean is slightly negative at -0.50%, consistent with the distribution of abnormal stock returns being right-skewed.[14] The mean and median change in cash holdings are close to zero, suggesting that the distribution of the change in cash holdings is relatively symmetric. However, the median cash holdings level is equivalent to 9.45% of market equity value at the beginning of the fiscal year, while the mean is much higher at 17.26%, suggesting that cash holdings are right-skewed. These two numbers are slightly higher than the cash ratios in Opler, Pinkowitz, Stulz, and Williamson (1999). Our statistics are not directly comparable to summary statistics in most other cash papers in the literature, however, because most papers use net assets or book assets to scale independent variables, whereas we use the lagged market value of equity, consistent with both the discussion of our hypotheses and the normalization of our variables. Note that the median leverage ratio of 22.65% and mean of 27.78% are consistent with Opler, Pinkowitz, Stulz, and Williamson (1999).

Table I also shows that on average profitability has been increasing over time as the changes in earnings are positive both at the mean and the median, consistent with findings in Pinkowitz and Williamson (2004). Firms' research and development expenditures have also increased on average over time. In contrast, interest expense and dividend payments appear to be quite stable.

In order to test our third hypothesis, we must analyze separately those firms that face greater financing constraints than others. There is a great deal of debate in the literature on how to measure financial constraints. Following Almeida, Campello, and Weisbach (2004), we use four alternative schemes to partition our sample.[15]

1. *Payout Ratio*

   The payout ratio is measured as total dividends (total common dividends plus repurchases) over earnings. For each year from 1972 to 2001, we sort firms according to their annual payout ratios and assign to the financially constrained (unconstrained) group those firms whose payout ratios are less (greater) than or equal to the payout ratio of

the firm at the 30th (70th) percentile of the annual payout ratio distribution.[16] Firms with high payout ratios are more likely to have ample internal funds to cover their debt obligations and to finance their investments, and should therefore receive lower benefits from cash holdings than firms with low payout ratios. Additionally, Fazzari, Hubbard, and Petersen (1988) document that financially constrained firms have significantly lower payout ratios.

2. *Firm Size*

   Larger firms are thought to be better known and have better access to capital markets than smaller firms, and should therefore face fewer constraints when raising capital to fund its investments. We use sales (12) as our measure of firm size.[17] For each year from 1972 to 2001, we rank all firms by their sales at the end of the previous fiscal year and assign to the financially constrained (unconstrained) group those firms whose sales are less (greater) than or equal to the sales in the bottom (top) three deciles of the annual size distribution.

3. *Long-Term Bond Rating*

   Firms that have access to public debt markets are able to raise funds from a source of capital that those without a rating are not able to access. The former firms are usually better known, and should face less difficulty in raising funds for their investment opportunities. COMPUSTAT provides data on firms' bond ratings starting in 1985. We assign to the financially unconstrained group those firm-years in which the firm has a bond rating when they report positive debt and to the constrained group those firm-years in which the firm does not have a bond rating but reports positive amounts of debt.[18] Faulkender and Petersen (2004) find that firms with a public debt rating (either a long-term bond rating or commercial paper rating) have significantly higher leverage ratios than firms without a debt rating, and the difference cannot be explained by firm characteristics previously found to determine observed capital structure. This finding is consistent with rated firms having better access to debt capital. They should therefore

be not as reliant on internal funds as those firms without a debt rating, reducing their marginal value of cash.

4. *Commercial Paper Rating*

   Firms with a commercial paper rating are an even more exclusive set and are considered among the safest group of publicly traded firms. We use the same categorization approach as above except that we look at the commercial paper rating instead of the long-term bond rating. The percentage of firm-years classified as having a commercial paper rating is 9.0% relative to 21.7% of firm-years classified as having a public bond rating.

IV. Empirical Results

This section contains results of regressions that test our empirical predictions. We begin in Section IV.A by testing the first two hypotheses, looking at the full sample over the entire period. We then demonstrate in Section IV.B the robustness of these results using three alternative measures of the unexpected change in cash over the fiscal year. In Section IV.C, we examine the effect of capital market accessibility (our third hypothesis) by using our various measures of financial constraints to subdivide the sample, testing the differences in the marginal value of cash across the subsamples. In additional robustness checks in Section IV.D, we examine three subsets of firms that are most likely to fall into the three cash regimes discussed above, based upon their cash position, cash generation, and investment opportunities. We also revisit the effects of capital market accessibility by examining the subset of firms that are most likely to want to raise capital, and we look for differences in the marginal value of cash based upon our four measures of financial constraints.

A. Findings for Cash Level and Leverage

One of our primary objectives is to measure the marginal value of cash for the average firm. The results obtained from the estimation of our regression model (equation (1)) are presented in Table II. The initial coefficient estimate corresponding to the change in cash holdings suggests that an extra dollar of cash is only valued by shareholders at \$0.75. Our

results change dramatically, though, when we allow the change in cash to interact with the level of cash ($C_{t-1} * \Delta C_t$) and with leverage ($L_t * \Delta C_t$), as seen in column 2 of Table II. These results indicate that the marginal value of cash is sensitive to both the amount of cash the firm already has on hand and to the percentage of the firm's capital structure that consists of debt. Recall that these are the variables that we added to test our first two empirical predictions. Having added these variables, the estimated marginal value of cash for a firm with zero cash and no leverage is \$1.47.

Insert Table II - Regression results for the whole sample here

As hypothesized, as firms' cash positions improve, the value of an additional dollar of cash decreases. The estimated coefficient corresponding to the interaction of the level of cash holdings with the change in cash is negative and statistically significant at better than 1%.[19] Economically, the estimate suggests that for two otherwise identical firms, a firm with cash holdings of 5% of equity has a marginal value of cash that is nearly 7.4 cents higher than a firm with cash holdings equal to 15% of its equity. In other words, for a firm with no leverage and cash holdings equal to 5% of their equity market capitalization, the value of an additional dollar of cash is \$1.43 (=\$1.466 + (-0.738*5%)), relative to \$1.36 for an otherwise equivalent firm with cash holdings equivalent to 15% of the value of their equity. This finding is consistent with our first hypothesis that firms with little or no cash on hand are likely to raise costly external funds and therefore would receive the highest benefits from having additional internal funds.

The results are also consistent with our second hypothesis that the marginal value of cash is decreasing in the amount of leverage. The significantly negative coefficient on $L_t * \Delta C_t$ suggests that an extra dollar of cash in an all-equity firm is worth 14.3 cents more to shareholders than an extra dollar in a firm with a 10% leverage ratio. This finding is consistent with debt holders receiving some of the benefit associated with an increase in the amount of cash the firm holds. As cash increases, the likelihood of the firm defaulting on the debt decreases, meaning that

some of the value associated with the firm having additional cash accrues to debt holders. The value of cash to shareholders is higher when the firm has very little debt since the change in the likelihood of default is lower than when there is a large amount of leverage.

Having included the effects of both leverage and the level of cash holdings and discussed the related findings, we can now estimate the marginal value of cash for the mean firm in our sample. Since most firms have some cash and some leverage, the marginal value of cash estimate is a function of the estimated coefficient on the marginal value of cash and the interactions with the level of cash holdings and with leverage. So, using the estimates from the second column, an extra dollar of cash holdings increases shareholder wealth by \$1.466 if the firm has zero cash and no leverage at the beginning of the fiscal year. However, the mean firm has cash holdings equivalent to 17.26% of the market capitalization of equity at the beginning of the fiscal year, and the mean leverage ratio is 27.78%. Therefore, the marginal value of cash to shareholders in the mean firm is \$0.94 (=\$1.466 + (-\$0.738*0.1726) + (-\$1.433*0.2778)). This finding suggests that less than the full value of the extra dollar of cash is incorporated into stock prices, consistent with shareholders valuing cash held by the firm at its after-shareholder-tax value.[20]

We also examine how the value of cash differs depending upon how cash is distributed to shareholders. As discussed above, for those firms that pay out cash to shareholders, we expect the value of an additional dollar of cash to be valued at less than a dollar since shareholders will have to pay taxes on that dollar when it is distributed. However, the tax rate applied to that dollar depends partially upon how it is paid. Throughout our sample period, the tax rate on dividends was higher than the tax rate on capital gains, the rate that would normally apply in the case of a share repurchase. Therefore, we expect that the marginal value of cash would be higher over our sample period for those firms that predominately return cash to shareholders in the form of repurchases rather than dividends.[21]

The results are consistent with our conjecture. In the third column of Table II, we examine just those firm-years with positive earnings in which cash is distributed to equity holders. When we include in our specification a variable interacting the change in cash with the percentage of

distributions that occur in the form of repurchases, we find a significantly higher value on cash for firms that predominately repurchase. Statistically, the coefficient is significant at better than 10%. The economic magnitude suggests that the equity market values an additional dollar of cash for a firm that carries out 100% of its equity payments in the form of repurchases 13.0 cents higher than an otherwise equivalent firm that pays out 100% of its equity payments in the form of dividends. These results are consistent with our hypothesis that the differential tax schedules on dividends and capital gains faced by shareholders play an important role in the value they place on the cash that firms hold.

Our estimated value difference naturally leads to the question of why dividend-paying firms would forgo the additional value that would be created by altering their payout structure. This question has puzzled researchers for years, leading to extensive examinations of payout policy. The findings of this literature suggest that firms recognize the value to be gained by moving towards repurchases. For instance, Grullon and Michaely (2002) find that beginning in 1999, "industrial firms spent more money on share repurchases than on dividend payments," (p. 1649) and that payout initiations are much more likely to be in the form of repurchases. While firms have not uniformly adopted repurchases as their only form of cash distribution to shareholders, the empirical evidence does suggest that firms are slowly moving more towards share repurchases, consistent with the additional value creation we document.

B. Alternative Measures of the Expected Change in Cash

So far, we use the entire change in cash in our econometric specifications. Since we examine changes in market values, the expected change in cash should be incorporated into the market equity value of the firm at the beginning of the fiscal year and the change in value should correspond to just the portion of the change in cash that is unexpected. Thus, the results that we present so far assume that the expected level of cash at the end of the fiscal year is equal to the value of cash at the end of the previous fiscal year. We now conduct robustness checks that use three alternative measures of the expected change in cash over the fiscal year, and we use the difference between the realized change and the expected change in our analysis.

The first measure of the expected change in cash uses the average change in cash in the benchmark portfolio during the corresponding fiscal year. If most firms in the same size and book-to-market portfolio increase their cash positions during the fiscal year, then the benchmark return should already reflect the effect of the average increase in cash, and the excess return should be the response to the change not already reflected in the benchmark return. As an example, assume that two firms both increase their cash position by 2% of the market value of the firm's equity. If most firms in the same size and book-to-market portfolio as the first firm also have a similar increase in their cash position, then the market's response to the cash increase would be incorporated into the average return of the firms in the benchmark portfolio, and the excess return should be close to zero. On the other hand, if the second firm belongs to a size and book-to-market portfolio in which most firms decrease their cash position, then the corresponding benchmark return would include this average decrease in cash. Assuming that increases in cash increase the market value of the equity, we would expect the excess return of the second firm in this example to be higher than that for the first firm, all else equal, since the second firm increases its cash relative to the expected drop in cash whereas the first firm increases its cash position, as it was expected to do. Results using this alternative measure of the change in cash are presented in the first column of Table III.

For the other two measures of the unexpected change, we use two models from Almeida, Campello, and Weisbach (2004) to estimate the expected change of cash holdings, controlling for industry fixed effects.[22] In both cases, changes in cash are regressed on factors that represent sources and uses of cash. We use the realizations of these factors at the end of the previous fiscal year to estimate the change that is expected to occur in the current fiscal year and then subtract those estimates from the realized change to obtain the unexpected piece. Since our objective is to estimate the market's expectation of the change of cash holdings that occurs during the current fiscal year, we restrict ourselves to information the market had at the beginning of the fiscal year. The first of these specifications is

$$\Delta CashHoldings_{i,t} = \alpha_0 + \alpha_1 CashFlow_{i,t-1} + \alpha_2 Q_{i,t-1} + \alpha_3 Size_{i,t-1} + \epsilon_{i,t}, \qquad (10)$$

where *Size* is measured as the natural log of book assets. The second equation from Almeida, Campello, and Weisbach (2004) adds capital expenditures, acquisitions, the change in net working capital, and the change in short-term debt as additional explanatory variables, all lagged and deflated by the lagged market value of assets. The results using these estimates of the unexpected change in cash appear in columns 2 and 3, respectively, of Table III.[23]

Insert Table III - Regressions with alternative definitions of the expected change in cash holdings.

The results in Table III are nearly identical to those using the realized change in cash found in column 2 of Table II, discussed above. The effects of leverage and cash levels are extremely similar in magnitude and have the same strong statistical significance. More debt in the firm's capital structure and higher cash levels both correspond to significantly lower marginal values of cash to the shareholders. After incorporating the leverage ratio and cash position of the average firm in the sample, we estimate the marginal value of cash to be \$0.95, \$0.93, and \$0.95, respectively. Recall that we estimate a value of \$0.94 when we use the entire change in cash rather than estimates of the unexpected change in cash. Even though these alternative methods should generate better estimates of the unexpected change in cash, they are still highly correlated with the overall change in cash. So, while these alternative measures likely have less noise, results using the absolute change in cash appear to be relatively unbiased. The stability of the estimated coefficients demonstrate the robustness of our findings regarding the value of additional corporate cash and how that value is influenced by the level of cash and the portion of the firm's capital structure that consists of debt.

C. Financial Constraints Results

Moving to the empirical implication that shareholders place a higher marginal value on the cash of constrained firms than on the cash of unconstrained firms, we split the sample using the four criteria outlined above. Table IV presents summary statistics for the constrained

and unconstrained groups under the four different financial constraints criteria. The letter (C) stands for constrained groups and (U) for unconstrained groups. The first row for each variable reports the mean value for the corresponding variable, with medians in brackets. There is a positive but imperfect association among the groups generated by the four criteria. Under all four criteria, the median change in cash holdings is negative for constrained firms, whereas the median change is zero or positive for unconstrained firms under three of the four criteria. This suggests that firms that have greater difficulty accessing capital (constrained firms) are more likely to draw down their cash holdings relative to unconstrained firms. Additionally, constrained firms have higher cash holdings than unconstrained firms under all four criteria, which is consistent with the findings in Almeida, Campello, and Weisbach (2004). The intuition is that constrained firms are more reliant on internal funds and therefore hold higher levels of cash than do firms that can easily access more cash when they need it. It is worth noting that with the exception of the use of firm size as our measure of a constrained firm, the number of financially constrained firms is much higher than the number of unconstrained firms.

Place Table IV - Summary Statistics for constrained and unconstrained groups here.

Using all four criteria, the results from splitting the firm-years into constrained and unconstrained subsamples are strongly consistent with our hypothesis. We find that the marginal value of cash is significantly higher for constrained firms than for unconstrained firms. As displayed in Table V, the estimated marginal value of cash for constrained firms, controlling for the interaction with the level of cash and with leverage, is significantly higher than the estimate for unconstrained firms, both statistically and economically.[24] The difference between the coefficients for the two different subsamples is significantly at better than 1% under all four criteria. Firms that can easily raise funds when they need cash should not carry a lot of cash, and the market does not place a high value on such cash because of the costs associated with holding cash (such as tax effects and agency costs). However, the market places a rather high value on liquidity for those firms that may face problems raising external capital when

they need to raise additional cash.

Place Table V - Regressions for constrained and unconstrained groups here.

The coefficients estimated on the interaction terms with cash holdings and leverage retain the statistical significance found in Table II in almost all of the specifications. However, the coefficients differ from each other across the subsamples. Under all four criteria, the coefficient corresponding to the interaction of the change in cash holdings with the level of cash is significantly more negative for constrained firms than for unconstrained firms. Constrained firms have a higher marginal value of cash when their current cash position is extremely small, consistent with internal cash being most valuable for firms that are likely to want to access external capital and that would face higher transactions costs when doing so. However, if the firm has a large cash balance, it is likely to distribute cash and the fact that it is constrained will not impact the value of cash. This effect manifests itself in the form of the marginal value of cash declining faster for constrained firms as cash holdings increase.

The differences in coefficients for the variable interacting the change in cash and leverage are not as stable across subsamples, but the coefficients are statistically different from zero in all of the specifications. This finding is consistent with debt holders receiving some of the additional value derived from higher cash holdings for the firm, regardless of whether the firm is financially constrained or unconstrained.

As before, since most firms have some cash on hand and debt in their capital structure, testing our third empirical implication requires incorporating the three coefficient estimates that include the change in cash as part of the corresponding variable's measure. Using the summary statistics from Table IV, we estimate that shareholders of a mean firm that is classified as financially constrained under the payout ratio criteria place a value of \$1.04 (=\$1.674 + (-\$0.904*0.188) + (-\$1.594*0.288)) on an extra dollar of cash, while shareholders of the mean financially unconstrained firm only place a value of \$0.77 (=\$1.066 + (-\$0.600*0.169) + (-\$0.836*0.2369)) on an extra dollar of cash. These numbers support our third empirical

implication in which we hypothesize that shareholders value the marginal dollar of cash for a constrained firm more highly than they do the marginal value of cash for an unconstrained firm. The estimated marginal values of cash under the other three constraint classifications are \$1.09 versus \$0.72 using size as the constrained criteria, \$1.15 versus \$0.73 using access to public debt markets, and \$1.09 versus \$0.46 using access to the commercial paper market. Under all four criteria, cash is more highly valued for constrained firms than it is for unconstrained firms. The differences in the marginal value of cash are all significant at better than 1%. Economically, the estimates range from \$0.27 to \$0.63, demonstrating how costly the market perceives difficulty in accessing capital markets to be, and the extent to which firms are rewarded with higher valuations for holding cash that helps them mitigate potential underinvestment.[25]

Looking at the differences in the other coefficients for the constrained versus unconstrained firms, another interesting result emerges. The change in net assets has a higher coefficient for the constrained firms relative to the unconstrained firms, a difference that is statistically significant at better than 5% under all four specifications.[26] While not the focus of our analysis, this finding suggests that the market responds more positively to new investments made by constrained firms. Together, these findings are consistent with the market responding more favorably when constrained firms are able to fund investment (represented by the net assets result) and when they are able to generate cash to fund future investments (represented by the findings for cash).

As with the results that examine the first two hypotheses, we now seek to verify that our results regarding the effects of financial constraints are robust to other estimates of the unexpected change in cash holdings during the fiscal year. We therefore once again divide the firms based upon our four constraints criteria and use the change in cash net of the average change in cash in the benchmark portfolio that year in our regression specification.[27] The results of these tests are located in Table VI.

Place Table VI - Robustness Checks for Constrained and Unconstrained Groups here.

When we replicate the examination of the marginal value of cash for constrained versus unconstrained firms using this alternative measure of the unanticipated change in cash, the results once again suggest that the marginal value of cash is significantly higher for constrained firms relative to unconstrained firms. The coefficients of both the unexpected change in cash variable and the interaction term corresponding to the product of the unexpected change in cash and the level of cash are statistically different from each other under all four constraints categorizations. Evaluated at the means for the two subsamples, the marginal value of cash is \$1.06 for the constrained group versus \$0.77 for the unconstrained group using the payout ratio as our classification criterion. Under the other three criteria, the values are \$1.10 versus \$0.73, \$1.19 versus \$0.77, and \$1.13 versus \$0.39, respectively. Once again, these differences are significantly different from each other at better than 1% under all four classification criteria. These results further confirm our third hypothesis that the market places a significantly higher value on an additional dollar of cash for those firms that are likely to face difficulty in accessing external capital markets.

D. Subsample Tests

To verify the robustness of our cross-sectional results, we focus on three subsamples of firms that are most likely to correspond to our three cash regimes and that should therefore differ in the value shareholders place on additional cash in the firm. Specifically, we divide the firms into quartiles based first upon a measure of interest coverage and separately upon their average industry market-to-book ratio, defined by their two-digit SIC code.[28] We define interest coverage as the sum of the beginning cash position of the firm and its earnings in that fiscal year divided by the interest expense over the fiscal year. A high interest coverage firm has less of their cash and cash flow obligated to debt and therefore has relatively more funds available for investment or distribution. We interpret the industry market-to-book ratio as a measure of the firm's investment opportunities, so the highest quarter of market-to-book

firm-years should have a higher value placed on an extra dollar of internal cash. We use an industry-level value because we want a measure that has not been affected by the market's incorporation into firm value the effect of financing constraints on the likelihood that the firm will be able to capitalize on these investment opportunities.[29]

First, we focus on the firms that have the lowest coverage and lowest industry market-to-book ratio. These are firms that have a relatively high portion of their cash and cash flow obligated to interest payments and that do not have good investment opportunities. We would therefore expect these firms to have low marginal cash values since they have relatively few investment opportunities and a significant part of any additional cash the firm attains is likely to go to the debt holders. The second group of firm-years have both low coverage and high market-to-book ratios. Such firms are also low on cash holdings but are likely to have investment opportunities, making them likely to have to access capital markets in order to take advantage of their available investments. Internal cash is therefore expected to be highly valued by these firms because it reduces the amount of costly external finance the firm would need to raise, thereby making it more likely that the investments are made. Finally, we look at firms that are in the top quarter of coverage ratios and the lowest quarter of market-to-book ratios. Such firms are expected to have low marginal values of cash since they hold larger balances, generate a great deal of cash, and do not have numerous investment opportunities, that is they are likely to be distributing cash. In addition to tax effects, these cash cow firms are also likely to suffer from agency costs described by Jensen (1986).

Insert Table VII - Results for three different coverage and M/B groups.

When we individually examine these three subsets of firm-years, the results of which are reported in Table VII, we find further empirical support for our hypotheses.[30] When we evaluate the first subset of firm-years for the low coverage and low market-to-book ratio firm-years, an additional dollar of cash is only valued at 45 cents. This finding is consistent with a firm having few investment opportunities and with a large portion of an additional dollar

of cash being claimed by the debt holders, thereby reducing the value of additional cash to the equity holders. For the second set of firms, those with low interest coverage and many investment opportunities, we find a marginal value of cash of $1.16. Consistent with our expectation, shareholders in firms with investment opportunities and low internal funds place a relatively higher value on the additional cash these firms attain. Finally, for the 'cash cow' firms, we find a marginal value of cash of only 53 cents. Combining these results, consistent with the results for the full sample, we find that the market places a higher value on the cash of those firms that are more likely to reinvest their cash into the firm and a lower value on the cash of those firms that are likely to distribute the cash to debt or equity holders.

To further estimate the importance of capital market access, we focus on the subset of firms that we estimate to have high marginal values of cash, namely, firms with investment opportunities but low coverage. Using this group of firms, we once again estimate the differences in the marginal value of cash for those that are categorized as constrained relative to those that are unconstrained. Since constrained firms are the firms that are most likely to want to access the capital markets in the near future, differences in the market value of cash relative to capital accessibility should be the greatest for this subset of firms.

Insert Table VIII - Constrained and Unconstrained groups with high M/B and low coverage.

Consistent with our earlier results, there are significant differences in the market value of cash based upon how difficult it is expected to be for this subset of firms to raise additional capital. As indicated by the results in Table VIII, the marginal value of cash is higher for firms that are categorized as constrained under all four measures. Statistically, the differences are significant at better than 5% in three of the four specifications.[31] Looking at the three criteria under which the difference is statistically significant, the economic interpretation of the difference in the marginal value of cash between constrained and unconstrained firms in this subsample ranges from 65 cents to $1.32. These differences are much greater than the differences we estimate for the entire sample, consistent with our hypothesis that these firms

are likely to be affected by their ability to access external capital. The results confirm that access to capital markets is an extremely important factor in the value the market places on an additional dollar of cash held by firms.

V. Conclusion

We use a revised event study methodology that examines market returns over firm fiscal years to test empirical predictions about the cross-sectional variation in the market value of cash. We find results consistent with all of our hypotheses. Specifically, we estimate that for the mean firm-year in the sample, the marginal value of cash is \$0.94. Additional cash is most highly valued by shareholders of firms with low levels of cash holdings, low leverage, and constraints in accessing financial markets. The marginal value of cash for the mean constrained firm-year ranges from 28 to 63 cents higher than the mean unconstrained firm, depending upon the constraints criterion. The results are even stronger when we focus on the subset of firms that are likely to need to raise external capital in the near future.

Our results suggest that the market perceives the presence of market frictions that make raising outside capital costly. The market rewards firms that retain liquidity with higher valuations, consistent with such firms being able to create more value than an otherwise equivalent firm with less internal cash. However, the results also suggest that the value of additional cash diminishes in the level of cash, implying that there may be an upper bound on the amount of cash for which the firm is rewarded for holding. This finding is consistent with both tax effects and agency costs.

Unlike examinations that focus on the cross-sectional variation in cash holdings, we focus on the value associated with those cross-sectional differences. Our methodology enables us to estimate the value of liquidity more precisely than can be done by studies of differences in levels of cash across firms or across time. As a result, we can estimate the magnitude of the value loss associated with the market frictions we examine and the extent to which liquidity can overcome these losses.

Considering the extent to which the market-to-book ratio is used to estimate value creation,

and the potential biases that we argue may be associated with it, a methodology such as ours that analyzes changes in value may have numerous other applications. As long as there is sufficient time-series variation in the underlying firm characteristics, estimating market reactions to such changes should provide more precise estimates of the value the equity holders place on such characteristics of interest.

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Notes

[1]There has been some work that estimates the value implications of excess cash flow. For instance, Hanson (1992) and Smith and Kim (1994) both find that bidding firms with high excess free cash flow exhibit low excess stock returns around merger announcements. Their estimated coefficients can be interpreted as the value destruction associated with high levels of excess free cash flow.

[2]Other related papers include Kim, Mauer, and Sherman (1998), Pinkowitz and Williamson (2001), Billett and Garfinkle (2004), Faulkender (2004), Ozkan and Ozkan (2002), Mikkelson and Partch (2003), Hartzell, Titman and Twite (2005) and Dittmar, Mahrt-Smith, and Wruck (2003).

[3]During the sample period, the appropriate tax rate τ_d varied considerably depending upon whether the cash distribution was done through a dividend payment or through a stock repurchase. We discuss this point in detail below.

[4]We would expect that this value differential would shrink in the future following the recent reduction in the dividend tax rate for individuals. We do not yet have sufficient data to verify that this has indeed occurred.

[5]In another related paper, Pinkowitz, Stulz, and Williamson (2003) extend the examination to cross-country differences in the marginal value of cash.

[6]Hennessy and Whited (2005) argue that an additional dollar of debt is more valuable if it goes to reducing costly external equity issuance rather than increasing cash distributions. However, since they only investigate one-period risk-free debt, they do not have a situation similar to our second regime discussed below.

[7]In the presence of agency costs, in which case there are conflicts between the interests of shareholders and the interests of debt holders, we would similarly expect to find the value of

cash holdings to equity holders decreasing with leverage. When the firm has a large amount of debt, positive NPV projects could predominately benefit debt holders, leading to a debt overhang (or Myers' (1977) underinvestment) problem. Highly levered firms are more likely to have debt overhang problems and pass up good projects.

[8]An exception is DeAngelo, DeAngelo, and Wruck (2002), who suggest that financial constraints may actually be beneficial if the constrained firm is likely to waste additional cash on negative NPV projects. So, if financially unconstrained firms are more likely to be run by managers that only invest in positive NPV projects, whereas constrained firms are associated with relatively worse managers, then additional cash would actually be valued higher by shareholders of unconstrained firms. If this effect dominates, then we would expect the opposite of our hypothesis, namely, that cash is more valuable for unconstrained firms. However, we do not believe that our measures of financial constraints identify firms that invest in value-destroying projects, so our hypothesis is unchanged.

[9]Initially, we examine the realized change in cash over the fiscal year, essentially assuming that the market's expectation of the level of cash at the end of the fiscal year is the cash level at the end of the previous fiscal year. In robustness checks that follow the initial specification, we use three alternative measures of the expected change in cash and then use the realized change in cash net of the estimated expected change in cash.

[10]As a robustness check, we also use stock returns in excess of the risk-free rate as our dependent variable and include the Fama and French three factors in the regression. Our results are robust to such a specification.

[11]In unreported regressions, we standardized by the lagged book value of assets rather than the lagged market value of equity and find strikingly different results, consistent with our criticism of standardizing by book values. Results are available upon request.

[12]While the Fama and French 25 portfolios are formed at the end of each June, the fiscal year-end of a firm could be any month during the year. Therefore, a firm could change the portfolio

to which it belongs during the year. Consider a firm whose fiscal year ends in December in year $t-1$. From January to June of year t, it belongs to the portfolio according to the size and BE/ME breakpoints of year $t-1$ and from July to December of year t, it belongs to the portfolio according to the size and BE/ME breakpoints of year t. Since we have value-weighted monthly returns of the portfolios, we calculate the benchmark return by annualizing the monthly returns from the portfolio it belongs to each month.

[13]See http://mba.tuck.dartmouth.edu/pages/faculty/ken.french. We thank him for graciously providing the data.

[14]Recall that the observations are trimmed at the 1% tails, which explains the nonzero mean.

[15]Almeida, Campello, and Weisbach (2004) actually use five alternative schemes. Since they do not find that the Kaplan-Zingales (1997) index is effective, we do not use it.

[16]In this way we make sure that all firms with the same payout ratio are in the same group, which generates an unequal number of observations being assigned to each of our groups.

[17]The results are robust to the use of total assets instead of sales.

[18]Whited (1992), Kashyap, Lamont, and Stein (1994), and Gilchrist and Himmelberg (1995) similarly categorize constrained and unconstrained firms.

[19]All reported regressions use White (1980) heteroscedastic-consistent errors, corrected for correlation across observations of a given firm.

[20]We add year dummies to our regression model to verify that the results are robust to year effects that may be correlated with changes in firm characteristics. The results are not significantly different and are available upon request.

[21]This analysis assumes that the market believes that future distributions will follow approximately the same mix of dividends and repurchases that the firm has used in the past year. Stephens and Weisbach (1998) document that firms take up to three years to complete

a repurchase program and numerous studies show that dividend payments are rather sticky (for a comprehensive review, see Allen and Michaely (2002)). Together, these findings suggest that there should be autocorrelation in distribution methods. We therefore argue that this is a reasonable assumption for the market to make.

[22]We deviate slightly from their model by normalizing the change in cash holdings and cash flow by the lagged market value of assets rather than current book value of assets, consistent with all of the other normalizations in this paper.

[23]The estimates are robust to estimating the expected change in cash industry-by-industry.

[24]We only show the results in which the dependent variable is left-censored at the 1% tail and right-censored at the 99% tail. The main results do not change if the dependent variable is left-censored at 5% and right-censored at 95%. The results are available upon request.

[25]While this examination is motivated theoretically by transaction costs, we are not suggesting that the differences in our estimates for constrained and unconstrained firms arise solely from direct transaction costs. Certainly, a portion of the magnitude may arise from the value effects of differences in the information the market possesses across our constraint classifications, consistent with the financial intermediation literature, as well as from potential differences in moral hazard across the subsets.

[26]The statistical significance of this difference is also found in the robustness checks we run using alternative measures of the expected change in cash (Table VI).

[27]We also reestimate the results using the two estimates of the expected change in cash holdings following Almeida, Campello, and Weisbach (2004); the results are economically and statistically similar. The results are available upon request.

[28]We also estimate these values using different cutoffs, such as thirds (9 groups) instead of quarters (16 groups). As expected, the magnitude of the differences in the estimates of the marginal value of cash across the subsamples increases as we increase the number of groups.

However, since the number of observations in each group decreases, the statistical difference between the estimates does not change a great deal.

[29]We also conduct robustness tests in which we use the individual firm's market-to-book ratio and the results are similar, statistically and economically.

[30]Note that in these regressions, we no longer interact the change in cash holdings with either the leverage ratio or the cash level, similar to the results presented in the first column of Table II. Since the cash level and interest expense are both used in classifying into which group the firm-year belongs, the cash level and leverage variables will have less variation within most of subsamples. Therefore, having controlled for their effects in the group categorization process, they have a much smaller impact in the subsample regressions, so we omit them.

[31]Few firm-years in the sample (126) with access to the commercial paper market also have high market-to-book ratios and low coverage. This may explain the insignificant difference that obtains when we use the presence of a commercial paper rating as our measure of financial constraint.

Table I
Summary Statistics for the 1972-2001 Sample

Variable	Mean	1^{st} Quartile	Median	3^{rd} Quartile	Std. Dev.
$r_{i,t} - R_{i,t}$	-0.0050	-0.3403	-0.0845	0.2014	0.5592
$\Delta' C_t$	0.0036	-0.0382	-0.0005	0.0348	0.1514
C_{t-1}	0.1726	0.0346	0.0945	0.2155	0.2248
$\Delta' E_t$	0.0105	-0.0382	0.0063	0.0461	0.2137
$\Delta' NA_t$	0.0190	-0.0871	0.0292	0.1599	0.5464
$\Delta' RD_t$	0.0009	0.0000	0.0000	0.0009	0.0196
$\Delta' I_t$	0.0008	-0.0040	0.0000	0.0070	0.0349
$\Delta' D_t$	-0.0003	0.0000	0.0000	0.0004	0.0100
L_t	0.2778	0.0616	0.2265	0.4445	0.2416
NF_t	0.0518	-0.0291	0.0015	0.0866	0.2604

This table provides summary statistics for the variables in our sample of firm-years from U.S.-based publicly traded firms over the period 1972 to 2001. $r_{i,t} - R^B_{i,t}$ is the excess stock return, where $r_{i,t}$ is the annual stock return of firm i at time t (fiscal year-end) and $R^B_{i,t}$ is stock i's benchmark portfolio return at time t. All variables except L_t and excess stock return are deflated by the lagged market value of equity (M_{t-1}). C_t is cash plus marketable securities, E_t is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, and NA_t is total assets minus cash holdings. I_t is interest expense, total dividends (D_t) are measured as common dividend paid, L_t is market leverage, and NF_t is the total equity issuance minus repurchases plus debt issuance minus debt redemption. ΔX_t is compact notation for the one-year change, $X_t - X_{t-1}$. The subscript $t-1$ means the value of the variable is at the beginning of fiscal year t or at the end of fiscal year $t-1$.

Table II
Regression Results for the Whole Sample

Independent Variables	I	II	III
ΔC_t	0.751***	1.466***	1.030***
	(0.02)	(0.038)	(0.054)
ΔE_t	0.529***	0.524***	0.806***
	(0.013)	(0.013)	(0.027)
ΔNA_t	0.151***	0.161***	0.155***
	(0.007)	(0.007)	(0.01)
ΔRD_t	1.350***	1.302***	1.423***
	(0.139)	(0.138)	(0.234)
ΔI_t	-1.516***	-1.448***	-1.922***
	(0.085)	(0.084)	(0.116)
ΔD_t	2.534***	2.504***	2.851***
	(0.188)	(0.186)	(0.229)
C_{t-1}	0.337***	0.263***	0.212***
	(0.012)	(0.013)	(0.015)
L_t	-0.475***	-0.477***	-0.417***
	(0.009)	(0.009)	(0.011)
NF_t	0.087***	0.059***	0.017
	(0.013)	(0.012)	(0.017)
$C_{t-1} * \Delta C_t$		-0.738***	-0.433***
		(0.055)	(0.069)
$L_t * \Delta C_t$		-1.433***	-1.086***
		(0.074)	(0.104)
Re_t			-0.014**
			(0.006)
$Re_t * \Delta C_t$			0.130*
			(0.07)
Intercept	0.057***	0.061***	0.082***
	(0.003)	(0.003	(0.004)
Observations	82187	82187	46444
Adj R2	0.19	0.20	0.20

This table presents the results of regressing the excess stock return $r_{i,t} - R^B_{i,t}$ on changes in firm characteristics over the fiscal year. All variables except L_t and excess stock return are deflated by the lagged market value of equity (M_{t-1}). C_t is cash plus marketable securities, E_t is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, and NA_t is total assets minus cash holdings. I_t is interest expense, total dividends (D_t) are measured as common dividends paid, L_t is market leverage, and NF_t is the total equity issuance minus repurchases plus debt issuance minus debt redemption. We also use RD_t expenditure, which is set to zero if missing and Re is the percentage of distributions to shareholders that occur in the form of repurchases (repurchase/(repurchase+dividend)). ΔX_t is compact notation for the one-year change, $X_t - X_{t-1}$. The subscript $t-1$ means the value of the variable is at the end of fiscal year $t-1$. The third regression is only on the subset of firms with positive earnings and positive payout in the corresponding fiscal year. White heteroscedastic-consistent standard errors, corrected for correlation across observations of a given firm, are in parentheses (White, 1980). * corresponds to significant at 10%; ** significant at 5%; *** significant at 1%.

Table III
Regressions with Alternative Definitions of the Expected Change in Cash Holdings

Independent Variables	Portf. Ave.	ACW (1)	ACW (2)
$\Delta' C_t$	1.463***	1.511***	1.520***
	(0.038)	(0.038)	(0.043)
$\Delta' E_t$	0.523***	0.498***	0.483***
	(0.013)	(0.013)	(0.014)
$\Delta' NA_t$	0.161***	0.175***	0.189***
	(0.007)	(0.007)	(0.007)
$\Delta' RD_t$	1.309***	1.408***	1.363***
	(0.138)	(0.14)	(0.152)
$\Delta' I_t$	-1.478***	-1.406***	-1.520***
	(0.085)	(0.085)	(0.097)
$\Delta' D_t$	2.589***	2.715***	2.862***
	(0.184)	(0.186)	(0.223)
C_{t-1}	0.250***	0.238***	0.252***
	(0.013)	(0.013)	(0.014)
L_t	-0.497***	-0.489***	-0.496***
	(0.009)	(0.009)	(0.01)
NF_t	0.066***	0.039***	0.033**
	(0.012)	(0.012)	(0.014)
$C_{t-1} * \Delta' C_t$	-0.789***	-0.739***	-0.839***
	(0.055)	(0.061)	(0.07)
$L_t * \Delta' C_t$	-1.361***	-1.619***	-1.530***
	(0.074)	(0.075)	(0.085)
Intercept	0.073***	0.073***	0.080***
	(0.003)	(0.003)	(0.004)
Observations	82187	81979	67859
Adj R2	0.20	0.20	0.21

This table presents the results of regressing the excess stock return $r_{i,t} - R^B_{i,t}$ on changes in firm characteristics over the fiscal year. All variables except L_t and excess stock return are deflated by the lagged market value of equity (M_{t-1}). $\Delta' C_t$ is compact notation for the realized one-year change in cash relative to the expected change in cash for that specification (details provided in Section V.B). C_t is cash plus marketable securities, E_t is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, and NA_t is total assets minus cash holdings. I_t is interest expense, total dividends (D_t) are measured as common dividends paid, L_t is market leverage, and NF_t is the total equity issuance minus repurchases plus debt issuance minus debt redemption. We also use RD_t expenditure, which is set to zero if missing. ΔX_t is compact notation for the one-year change, $X_t - X_{t-1}$. The subscript $t-1$ means the value of the variable is at the end of fiscal year $t-1$. White heteroscedastic-consistent standard errors, corrected for correlation across observations of a given firm, are in parentheses (White, 1980). * corresponds to significant at 10%; ** significant at 5%; *** significant at 1%.

Table IV
Summary Statistics for Constrained and Unconstrained Groups

Financial	Payout Ratio		Firm Size		Bond Ratings		Comm. Paper Ratings	
Criteria	(C)	(U)	(C)	(U)	(C)	(U)	(C)	(U)
dC_t	0.0034	-0.0078	-0.0051	0.0063	-0.0005	0.0085	0.0015	0.0015
	[-0.0015]	[-0.0027]	[-0.0050]	[0.0004]	[-0.0010]	[0.0004]	[-0.0007]	[0.0000]
C_{t-1}	0.1884	0.1686	0.2152	0.1344	0.1559	0.1222	0.1569	0.0626
	[0.0993]	[0.0958]	[0.1203]	[0.0718]	[0.0791]	[0.0519]	[0.0789]	[0.0334]
dE_t	0.0249	-0.0315	0.0196	0.0032	0.0095	0.0036	0.0091	-0.0008
	[0.0092]	[-0.0057]	[0.0049]	[0.0057]	[0.0044]	[0.0052]	[0.0050]	[0.0031]
dNA_t	-0.0116	-0.0193	0.0278	0.0203	0.0370	0.0776	0.0456	0.0492
	[0.0271]	[0.0076]	[0.0178]	[0.0301]	[0.0321]	[0.0379]	[0.0351]	[0.0243]
dRD_t	0.0007	0.0007	0.0014	0.0005	0.0009	0.0005	0.0009	0.0004
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
dI_t	-0.0005	0.0007	0.0012	0.0006	0.0004	0.0036	0.0011	0.0009
	[0.0000]	[0.0000]	[0.0000]	[0.0002]	[0.0001]	[0.0007]	[0.0002]	[0.0001]
dD_t	-0.0013	-0.0005	-0.0001	-0.0003	-0.0007	-0.0005	-0.0007	0.0001
	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0004]
L_t	0.2873	0.2369	0.2149	0.3079	0.2537	0.3466	0.2771	0.2447
	[0.2176]	[0.1874]	[0.1268]	[0.2694]	[0.1913]	[0.3046]	[0.2210]	[0.2177]
NF_t	0.0744	0.0124	0.0762	0.0321	0.0549	0.0619	0.0604	0.0154
	[0.0073]	[-0.0046]	[0.0028]	[0.0012]	[0.0019]	[0.0043]	[0.0028]	[-0.0023]
Observations	32822	24436	25152	24022	34691	9608	40300	3999

This table presents summary statistics for key variables across groups of financially constrained and unconstrained firms (see text for definitions) from 1972 to 2001. The first number corresponds to the mean and the medians are in brackets. We use letter (C) for constrained firms and (U) for unconstrained firms. $r_{i,t} - R^B_{i,t}$ is the excess stock return, where $r_{i,t}$ is the annual stock return of firm i at time t (fiscal year-end) and $R^B_{i,t}$ is stock i's benchmark portfolio return at time t. All variables except L_t and excess stock return are deflated by the lagged market value of equity (M_{t-1}). C_t is cash plus marketable securities, E_t is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, and NA_t is total assets minus cash holdings. I_t is interest expense, total dividends (D_t) are measured as common dividends paid, L_t is market leverage, and NF_t is the total equity issuance minus repurchases plus debt issuance minus debt redemption. ΔX_t is compact notation for the one-year change, $X_t - X_{t-1}$. The subscript $t-1$ means the value of the variable is at the beginning of fiscal year t or at the end of fiscal year $t-1$.

Table V
Regressions for Constrained and Unconstrained Groups

Independent	Payout Ratio		Firm Size		Bond Ratings		Comm. Paper Ratings	
Variables	(C)	(U)	(C)	(U)	(C)	(U)	(C)	(U)
ΔC_t	1.674***	1.066***	1.621***	1.123***	1.706***	1.339***	1.685***	0.707***
	(0.054)	(0.072)	(0.059)	(0.088)	(0.06)	(0.161)	(0.056)	(0.217)
p-value $(C - U \neq 0)$	0.00		0.00		0.03		0.00	
ΔE_t	0.480***	0.459***	0.490***	0.505***	0.497***	0.537***	0.500***	0.522***
	(0.016)	(0.029)	(0.023)	(0.028)	(0.018)	(0.043)	(0.017)	(0.075)
ΔNA_t	0.160***	0.123***	0.180***	0.118***	0.190***	0.095***	0.177***	0.122***
	(0.009)	(0.014)	(0.013)	(0.011)	(0.011)	(0.018)	(0.01)	(0.026)
ΔRD_t	1.399***	0.474	1.655***	-0.105	0.933***	0.301	0.946***	-0.802
	(0.171)	(0.314)	(0.202)	(0.287)	(0.189)	(0.538)	(0.182)	(0.771)
ΔI_t	-1.249***	-1.084***	-1.010***	-1.710***	-1.640***	-1.525***	-1.604***	-3.220***
	(0.118)	(0.182)	(0.175)	(0.147)	(0.152)	(0.251)	(0.134)	(0.58)
ΔD_t	2.115***	2.703***	3.725***	1.750***	1.661***	0.665	1.459***	0.569
	(0.377)	(0.266)	(0.405)	(0.317)	(0.311)	(0.599)	(0.286)	(1.009)
C_{t-1}	0.321***	0.206***	0.272***	0.326***	0.309***	0.420***	0.327***	0.312***
	(0.021)	(0.021)	(0.023)	(0.024)	(0.023)	(0.049)	(0.022)	(0.082)
p-value $(C - U \neq 0)$	0.02		0.00		0.01		0.00	
L_t	-0.555***	-0.317***	-0.547***	-0.446***	-0.657***	-0.638***	-0.642***	-0.405***
	(0.013)	(0.016)	(0.017)	(0.015)	(0.014)	(0.026)	(0.013)	(0.035)
NF_t	0.083***	-0.027	0.132***	-0.006	0.064***	0.059*	0.049**	0.104
	(0.018)	(0.026)	(0.024)	(0.021)	(0.021)	(0.033)	(0.019)	(0.065)
$C_{t-1} * \Delta C_t$	-0.904***	-0.600***	-1.014***	-0.219**	-0.860***	-0.145	-0.756***	0.271
	(0.083)	(0.098)	(0.092)	(0.111)	(0.093)	(0.184)	(0.085)	(0.287)
$L_t * \Delta C_t$	-1.594***	-0.836***	-1.451***	-1.229***	-1.646***	-1.716***	-1.724***	-1.089*
	(0.104)	(0.14)	(0.119)	(0.18)	(0.125)	(0.319)	(0.115)	(0.581)
Intercept	0.057***	-0.014***	0.022***	0.080***	0.078***	0.134***	0.084***	0.067***
	(0.006)	(0.005)	(0.007)	(0.005)	(0.005)	(0.009)	(0.005)	(0.009)
Observations	32822	24436	25152	24022	34691	9608	40300	3999
Adj R2	0.22	0.16	0.2	0.19	0.22	0.22	0.22	0.11

This table presents regression results across groups of financially constrained and unconstrained firms (see text for definitions) from 1972 to 2001. We use letter (C) for constrained firms and (U) for unconstrained firms. The dependent variable in all regressions is $r_{i,t} - R^B_{i,t}$ the excess stock return, where $r_{i,t}$ is the annual stock return of firm i during fiscal year t and $R^B_{i,t}$ is stock i's benchmark portfolio return during fiscal year t. All variables except L_t and excess stock return are deflated by the lagged market value of equity (M_{t-1}). C_t is cash plus marketable securities, E_t is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, and NA_t is total assets minus cash holdings. I_t is interest expense, total dividends (D_t) are measured as common dividends paid, L_t is market leverage, and NF_t is the total equity issuance minus repurchases plus debt issuance minus debt redemption. We also use $R\&D$ expenditure, which is set to zero if missing. ΔX_t is compact notation for the one-year change, $X_t - X_{t-1}$. The subscript $t-1$ means the value of the variable is at the end of fiscal year $t-1$. White heteroscedastic consistent standard errors, corrected for correlation across observations of a given firm, are in parentheses (White, 1980). Note: * corresponds to significant at 10%; ** significant at 5%; *** significant at 1%.

Table VI
Robustness Checks for Constrained and Unconstrained Firms

Independent	Payout Ratio		Firm Size		Bond Ratings		Comm. Paper Ratings	
Variables	(C)	(U)	(C)	(U)	(C)	(U)	(C)	(U)
$\Delta' C_t$	1.677***	1.064***	1.627***	1.110***	1.715***	1.338***	1.698***	0.638***
	(0.054)	(0.072)	(0.059)	(0.088)	(0.059)	(0.16)	(0.056)	(0.216)
p-value $(C - U \neq 0)$	0.00		0.00		0.02		0.00	
$\Delta' E_t$	0.476***	0.458***	0.482***	0.509***	0.494***	0.531***	0.496***	0.528***
	(0.016)	(0.029)	(0.023)	(0.028)	(0.018)	(0.043)	(0.017)	(0.068)
$\Delta' NA_t$	0.161***	0.122***	0.181***	0.119***	0.192***	0.095***	0.179***	0.119***
	(0.009)	(0.014)	(0.013)	(0.011)	(0.011)	(0.018)	(0.01)	(0.028)
$\Delta' RD_t$	1.396***	0.525*	1.652***	-0.139	0.941***	0.277	0.950***	-0.77
	(0.171)	(0.313)	(0.203)	(0.284)	(0.189)	(0.534)	(0.182)	(0.786)
$\Delta' I_t$	-1.291***	-1.105***	-1.030***	-1.771***	-1.649***	-1.463***	-1.598***	-3.190***
	(0.119)	(0.185)	(0.177)	(0.148)	(0.153)	(0.252)	(0.135)	(0.599)
$\Delta' D_t$	2.171***	2.714***	3.789***	1.852***	1.672***	0.838	1.522***	0.359
	(0.373)	(0.266)	(0.41)	(0.309)	(0.314)	(0.616)	(0.289)	(1.002)
C_{t-1}	0.299***	0.191***	0.247***	0.328***	0.292***	0.411***	0.308***	0.317***
	(0.021)	(0.021)	(0.022)	(0.025)	(0.023)	(0.05)	(0.022)	(0.082)
L_t	-0.582***	-0.331***	-0.572***	-0.460***	-0.688***	-0.661***	-0.671***	-0.432***
	(0.014)	(0.016)	(0.017)	(0.015)	(0.014)	(0.026)	(0.013)	(0.034)
NF_t	0.088***	-0.019	0.140***	-0.004	0.071***	0.061+	0.054***	0.113+*
	(0.018)	(0.026)	(0.024)	(0.021)	(0.021)	(0.034)	(0.019)	(0.064)
$C_{t-1} * \Delta' C_t$	-0.970***	-0.658***	-1.090***	-0.217**	-0.961***	-0.281	-0.868***	0.254
	(0.083)	(0.098)	(0.093)	(0.109)	(0.093)	(0.18)	(0.085)	(0.285)
p-value $(C - U \neq 0)$	0.01		0.00		0.00		0.00	
$L_t * \Delta' C_t$	-1.517***	-0.766***	-1.365***	-1.155***	-1.481***	-1.547***	-1.572***	-1.083*
	(0.105)	(0.139)	(0.12)	(0.18)	(0.124)	(0.317)	(0.113)	(0.583)
Intercept	0.076***	-0.007	0.042***	0.086***	0.092***	0.144***	0.098***	0.073***
	(0.006)	(0.005)	(0.007)	(0.005)	(0.005)	(0.009)	(0.005)	(0.009)
Observations	32509	23182	24702	23505	34367	9314	39882	3799
Adj R2	0.22	0.16	0.2	0.19	0.23	0.22	0.22	0.11

This table presents regression results across groups of financially constrained and unconstrained firms (see text for definitions) from 1972 to 2001. We use letter (C) for constrained firms and (U) for unconstrained firms. The dependent variable in all regressions is $r_{i,t} - R^B_{i,t}$ the excess stock return, where $r_{i,t}$ is the annual stock return of firm i during fiscal year t and $R^B_{i,t}$ is stock i's benchmark portfolio return during fiscal year t. All variables except L_t and excess stock return are deflated by the lagged market value of equity (M_{t-1}). $\Delta' C_t$ is compact notation for the one-year change in cash relative to the average one-year change in cash for the average firm in the corresponding benchmark portfolio. C_t is cash plus marketable securities, E_t is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, and NA_t is total assets minus cash holdings. I_t is interest expense, total dividends (D_t) are measured as common dividends paid, L_t is market leverage, and NF_t is the total equity issuance minus repurchases plus debt issuance minus debt redemption. We also use RD_t expenditure, which is set to zero if missing. ΔX_t is compact notation for the one-year change, $X_t - X_{t-1}$. The subscript $t-1$ means the value of the variable is at the end of fiscal year $t-1$. White heteroscedastic-consistent standard errors, corrected for correlation across observations of a given firm, are in parentheses (White, 1980). Note: * corresponds to significant at 10%; ** significant at 5%; *** significant at 1%.

Table VII
Results for Three Different Coverage and M/B Groups

Independent Variables	I	II	III
ΔC_t	0.448***	1.159***	0.528***
	(0.06)	(0.116)	(0.07)
ΔE_t	0.275***	0.320***	0.551***
	(0.023)	(0.046)	(0.085)
ΔNA_t	0.091***	0.090***	0.250***
	(0.012)	(0.03)	(0.047)
ΔRD_t	0.43	0.929**	0.225
	(0.482)	(0.431)	(1.056)
ΔI_t	-0.756***	-0.383	-1.624**
	(0.146)	(0.372)	(0.639)
ΔD_t	0.997**	2.309***	5.436***
	(0.412)	(0.893)	(0.674)
C_{t-1}	0.431***	0.831***	0.104***
	(0.048)	(0.094)	(0.031)
L_t	-0.439***	-0.614***	-0.439***
	(0.036)	(0.047)	(0.075)
NF_t	0.022	0.169***	-0.029
	(0.025)	(0.051)	(0.099)
Intercept	-0.024	0.02	-0.029***
	(0.02)	(0.022)	(0.01)
Observations	6000	3234	3981
Adj R2	0.15	0.19	0.14

This table presents the results of regressing the excess stock return $r_{i,t} - R^B_{i,t}$ on changes in firm characteristics over the fiscal year. All variables except L_t and excess stock return are deflated by the lagged market value of equity (M_{t-1}). C_t is cash plus marketable securities, E_t is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, and NA_t is total assets minus cash holdings. I_t is interest expense, total dividends (D_t) are measured as common dividends paid, L_t is market leverage, and NF_t is the total equity issuance minus repurchases plus debt issuance minus debt redemption. We also use RD_t expenditure, which is set to zero if missing. ΔX_t is compact notation for the one-year change, $X_t - X_{t-1}$. The subscript $t-1$ means the value of the variable is at the end of fiscal year $t-1$. Regression I is on the subset of firms in the bottom quarter of interest coverage and the bottom quarter of the industry market-to-book ratio. Interest coverage is defined to be (cash+earnings)/interest expense. Regression II is on firms in the bottom quarter of interest coverage and the top quarter of the industry market-to-book ratio. Regression III is on firms in the top quarter of interest coverage and the bottom quarter of the industry market-to-book ratio. White heteroscedastic-consistent standard errors, corrected for correlation across observations of a given firm, are in parentheses (White, 1980). * corresponds to significant at 10%; ** significant at 5%; *** significant at 1%.

Table VIII
Constrained and Unconstrained Firms with High M/B and Low Coverage

Independent	Payout Ratio		Firm Size		Bond Ratings		Comm. Paper Ratings	
Variables	(C)	(U)	(C)	(U)	(C)	(U)	(C)	(U)
ΔC_t	1.159***	0.510**	1.166***	0.489***	1.506***	0.186	1.343***	1.934***
	(0.161)	(0.245)	(0.229)	(0.174)	(0.174)	(0.212)	(0.153)	(0.722)
p-value $(C - U \neq 0)$	0.03		0.02		0.00		0.41	
ΔE_t	0.277***	0.355***	0.275***	0.464***	0.282***	0.637***	0.286***	0.555**
	(0.064)	(0.095)	(0.104)	(0.07)	(0.064)	(0.137)	(0.061)	(0.219)
ΔNA_t	0.011	0.092*	-0.036	0.063	0.090**	0.036	0.089**	-0.231**
	(0.049)	(0.055)	(0.068)	(0.039)	(0.044)	(0.063)	(0.04)	(0.1)
ΔRD_t	0.953	0.349	1.38	0.466	0.647	0.714	0.704	3.021*
	(0.597)	(0.96)	(0.843)	(0.681)	(0.546)	(0.796)	(0.526)	(1.752)
ΔI_t	-0.386	-0.38	0.957	-1.361***	-1.062*	-1.165	-1.196**	0.887
	(0.67)	(0.61)	(0.882)	(0.44)	(0.593)	(0.798)	(0.566)	(1.605)
ΔD_t	1.721	3.247**	7.371***	1.959*	0.96	2.427*	0.939	5.295
	(1.647)	(1.314)	(2.589)	(1.14)	(1.874)	(1.428)	(1.546)	(3.488)
C_{t-1}	0.830***	0.728***	0.686***	0.586***	0.987***	0.475**	0.902***	1.064*
	(0.17)	(0.14)	(0.245)	(0.12)	(0.178)	(0.224)	(0.154)	(0.635)
L_t	-0.504***	-0.649***	-0.566***	-0.567***	-0.745***	-0.754***	-0.708***	-0.367
	(0.065)	(0.101)	(0.092)	(0.103)	(0.062)	(0.132)	(0.059)	(0.231)
NF_t	0.341***	0.1	0.395***	0.064	0.233***	0.172	0.269***	0.270*
	(0.079)	(0.087)	(0.117)	(0.076)	(0.08)	(0.122)	(0.076)	(0.142)
Intercept	-0.109***	0.061	-0.036	0.129***	-0.022	0.234***	-0.02	0.037
	(0.031)	(0.044)	(0.043)	(0.048)	(0.029)	(0.063)	(0.028)	(0.076)
Observations	1404	821	861	843	1678	399	1827	126
Adj R2	0.20	0.16	0.21	0.17	0.25	0.24	0.25	0.18

This table presents regression results across groups of financially constrained and unconstrained firms with low coverage ratios and high industry market-to-book ratios (see text for definitions) from 1972 to 2001. We use letter (C) for constrained firms and (U) for unconstrained firms. These are results of regressing the excess stock return $r_{i,t} - R^B_{i,t}$ on changes in firm characteristics over the fiscal year. All variables except L_t and excess stock return are deflated by the lagged market value of equity (M_{t-1}). C_t is cash plus marketable securities, E_t is earnings before extraordinary items plus interest, deferred tax credits, and investment tax credits, and NA_t is total assets minus cash holdings. I_t is interest expense, total dividends (D_t) are measured as common dividends paid, L_t is market leverage, and NF_t is the total equity issuance minus repurchases plus debt issuance minus debt redemption. We also use RD_t expenditure, which is set to zero if missing. ΔX_t is compact notation for the one-year change, $X_t - X_{t-1}$. The subscript $t-1$ means the value of the variable is at the end of fiscal year $t-1$. White heteroscedastic-consistent standard errors, corrected for correlation across observations of a given firm, are in parentheses (White, 1980). * corresponds to significant at 10%; ** significant at 5%; *** significant at 1%.